evidence that this method is also used with parts that are to be pressed onto one another. This rejection is traversed for the following reasons.

The invention of claim 1 is directed to a glow plug comprising a rod-shaped heating element composed of an electrically conductive ceramic material, a carrier ring attached to the rod-shaped heating element composed of an electrically conductive material, and a tubular casing attached to the carrier ring so as to surround the rod-shaped heating element and carrier ring. The carrier ring is attached to the rod-shaped heating element using a magnetic forming process as a result of which the carrier ring and rod-shaped heating element are in a plastically deformable state which is free of surface damage and thermal effects of being heated during attachment. Claim 2 adds that the tubular casing has been attached to the carrier ring using a magnetic forming process with the same results. Claim 3 recites a glow plug similar to claims 1 & 2 with the additional feature of a contact sleeve for attachment to the rod-shaped heating element by a magnetic forming process with the same results, wherein the carrier ring has an external diameter greater than that of the contact sleeve and the tubular casing does not physically contact the contact sleeve.

The claims differ from the prior art and the asserted combination of features allegedly taught by the prior art in several respects. First, neither Haussner nor Brower discloses a rod-shaped heating element with a carrier ring attached thereto and a tubular casing *attached to the carrier ring so as to surround the rod-shaped heating element* ***and*** *the carrier ring.* In Haussner, a body 7 has an annular edge with an end 7a that is pressed into a groove 3a of the shaped part 3. The heating rod 1 is pressed into the body 7 with the shaped part 3. There is no interlocking between the shaped part 3 with the heating rod 1 and the body 7 so that the body 7 can be twisted relative to the shaped part 3, as explained in col. 1, line 64 through col. 2, line 13. Brower merely joins outer member 19 directly to inner member 21 with no carrier ring disposed therebetween. The MagnetoPulS publication does not remedy this deficiency. Thus, this feature that appears in each claim is missing.

Second, none of the references teaches of an attachment between elements using a magnetic forming process as a result of which the elements are in a plastically deformed state which is free of surface damage and thermal effects of being heated during attachment. In Haussner, as has been previously argued and acknowledged by the Examiner, the attachment is made by a press fit, which is recognized to be a different process with different results from

a magnetic forming process. A press fit connection (also known as an interference fit) inherently results in at least one of the parts that are so joined being scuffed because the inner part has an outer diameter that is slightly larger than the inner diameter of the part that it is being pressed into. Scuffing damages the corrosion protection of the joined parts (e.g., the force of being joined together would damage the coating applied to the plug body).

Brower's process of attachment is thermal shrink fitting with the **addition** of an application of a high intensity varying magnetic field. In the Brower process, outer member 19 and inner member 21 are positioned in a heating device 23 and a cooling device 27, respectively, to cause expansion and contraction of the members and then they aer quickly fed co-axially into the work space. An energy source 31 is activated to create a high intensity field around the work space, which acts on the outer member 19 to reduce the diameter and squeeze it onto the inner member 21. The joined members are allowed to return to ambient temperature and the subsequent expansion and contraction increases the tightness of the connection (col. 3, line 64 – col. 4, line 3.) Inner member 21 must be a shape that mates with the opening on the outer member and has sufficient structural strength to resist deformation when the outer member 19 is squeezed onto it (col. 2, lines 43-53.) If one of the members is made of a material such as ceramic, the dimension change of the other member will be used to effect the desired fit (col. 5, lines 34-40.) This method can be performed even when there is a wide initial clearance between the members, which is an important advantage because the outer member may be easily and rapidly fit with ample clearance over the inner member in assembly so that minimal heat transfer results during the process and so that the requirement of relatively close machining tolerances normally required in shrink fitting is eliminated. This advantage is particularly important if the members are long in comparison with their diameters (col. 4, lines 4-19.)

In contrast, in the claimed glow plug, the elements are attached using a magnetic forming process are in a plastically deformed state which is **free of surface damage and thermal effects of being heated during attachment**. In contrast, magnetic forming produces a noncontact deformation and provides a uniformly rigid attachment over the entire area of the joint without any surface damage. Haussner's process damages the surface through the press fit, and Brower's process, in fact, relies on thermal effects of heating, not plastic deformation to create the attachment. Thus, neither reference discloses or even

suggests of the attachment recited in the claims. Moreover, the MagnetoPulS publication does not remedy the deficiencies of these disclosures and does not suggest that attachment could be made in these devices by a magnetic forming process. There must be some cogent reason shown for modifying the attachment methods of Haussner and Brower. There is simply no teaching in the prior art of a glow plug with an attachment between elements as claimed.

The Office Action suggests that a reason for modifying Haussner's invention in view of Brower is that the prior art is reasonably pertinent to the particular problem of eliminating any surface damage and thermal effect to the glow plug structure in accordance with MPEP 2141.01(a) and as evidenced by MagnetoPulS. The MPEP section relates to analogous and non-analogous prior art. The sole fact that the prior art is related to the field of Applicant's endeavor is not a sufficient reason to support an assertion that it would have been obvious to modify Haussner's invention in view of Brower. Further, evidence of the mere existence of a technology, in this case MagnetoPulS' magnetic forming process, does not provide a sufficient reason as to why it would be used on assemblies that are not disclosed as having a deformation-related attachment problem. In fact, the only suggestion that deformation is a problem with glow plugs comes from Applicant's own disclosure. The applied prior art does not relate to the problem with which the Applicant was concerned, that is the attachment of elements in glow plugs in which the risk of buckling the glow pencil and the connection pole is eliminated and a design that permits the use of very thin glow pencils and glow pencils formed of brittle material, as noted in the original specification at paragraphs [0014] and [0015]. Thus, a proper prima facie case of obviousness has not been made.

Relative to claim 3, in addition to the magnetic deformation attachment feature, this claim requires that the "cylindrical carrier ring has an external diameter which is greater than that of the contact sleeve" and the specification indicates at paragraph [0017] that this is done "so that the glow plug body 3 does not physically contact the contact sleeve 6," relative to which it needs to be insulated. Although this was explained in the Appeal Brief, the rejection still refers to sleeve 4 that is not a "contact" sleeve, but rather is a holder for an insulating ring 5 (column 2, lines 3-5 of Haussner.) While Applicant's tubular casing has "been attached to said cylindrical carrier ring by a magnetic forming process ***so as not to physically contact said contact sleeve***," sleeve 4 of Haussner is clearly shown in Fig. 1 as contacting

their tubular casing 7. Still further, claim 3 indicates that the applicant's sleeve axially extends from the claimed rod-shaped heating element (as is shown in Figs. 3 & 4 of the present application). On the other hand, that is clearly not the case for sleeve 4 relative to Haussner's heating rod 1, being located entirely intermediate the ends of the heating rod. This discrepancy has not been addressed in the new rejection.

In summary, Haussner teaches press fitting and Brower teaches shrink fitting by thermal deformation. Both of these references point to a connection made by dimensional or surface deformation, which is precisely excluded in the claimed invention. Applicant has discovered a use for a magnetic forming process, such as that disclosed in MagnetoPulS to manufacture glow plugs and has identified a problem and reason for avoiding press fit and shrink fit attachments. Each claim recites attachment using a magnetic forming process as a result of which the joined elements are in a plastically deformed state which is free of surface damage and thermal effects of being heated during attachment. There is no indication in the prior art that surface damage and thermal effects of being heated during attachment are problems in the manufacture of glow plugs. As such, there is no valid reason for asserting it would have been obvious to modify Haussner in view of Brower to result in the claimed invention.

Thus, as the claims structurally distinguish their subject matter from that of the applied prior art, they cannot properly be considered to have been rendered obvious by the asserted combination. Claims 1-3 are allowable and the rejections thereof are requested to be withdrawn..

Respectfully submitted,

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